



Original article

Pro-Tobacco Influences and Susceptibility to Smoking Cigarettes Among Middle and High School Students—United States, 2011

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A B S T R A C T

Purpose: Smoking is a leading cause of cancer, and most smokers begin during adolescence. We examined the proportion of adolescents exposed to pro-tobacco advertising and assessed the association between this exposure and susceptibility to smoking.

Methods: Data from the 2011 National Youth Tobacco Survey were used to calculate the proportion of susceptible middle school (MS) and high school (HS) students exposed to pro-tobacco advertisements through stores, magazines, and the Internet. Following previous work, susceptibility to smoking cigarettes was defined as “never smoked but open to trying cigarettes.”

Results: In 2011, 81.5% of MS students and 86.9% of HS students were exposed to tobacco advertisements in stores; 48.2% of MS students and 54.0% of HS students were exposed to such advertising in magazines. Exposure to tobacco advertisements on the Internet was similar for MS (40.8%) and HS students (40.2%). Of those surveyed, 22.5% of MS students and 24.2% of HS students were susceptible to trying cigarettes. Exposure to magazine advertising declined from 71.8% in 2000 to 46.1% in 2009 among susceptible MS students; however, exposure increased to 55.4% in 2011. Tobacco advertising seen through the Internet among susceptible HS students increased from 25.9% in 2000 to 44.7% in 2011.

Conclusions: Adolescents continue to be exposed to pro-tobacco advertisements. Adolescents susceptible to smoking are more likely to report exposure to pro-tobacco advertisements. In addition to continued monitoring, more effective interventions to eliminate youth exposure to pro-tobacco marketing are needed.

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**IMPLICATIONS AND
CONTRIBUTION**

Despite tobacco control efforts, adolescents continue to be highly exposed to pro-tobacco advertisements through stores, magazines, and the Internet, especially adolescents susceptible to trying cigarettes. Therefore, more interventions to eliminate adolescent exposure to pro-tobacco marketing are needed to maximize the effects of programs designed to prevent adolescents from smoking.

Although cigarette smoking declined significantly during the past 50 years, smoking continues to be the single leading preventable cause of death and disease in the United States [1]. Smoking causes multiple types of malignancies including can-

cers of the lung, throat, mouth, nasal cavity, esophagus, stomach, pancreas, kidney, bladder, and cervix; it also causes acute myeloid leukemia [2] and causes approximately 443,000 deaths annually [3]. Given that >80% of established adult smokers began smoking before age 18 years [4], preventing youth from taking up smoking is critical to reducing morbidity and mortality.

Steep declines in young people's smoking were observed from 1997 to 2003 [5]. However, the rate of decline has dramatically slowed in recent years (2003–2009) [5]. This slowing in the rate of decline may be attributed, in part, to the lack of change in the proportion of youth who never smoked but are open to trying cigarettes in the next year, also known as susceptible youth [6,7].

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Data from the National Youth Tobacco Survey (NYTS) indicate that from 2000 to 2009 [8], the percentage of middle school (MS) and high school (HS) students susceptible to smoking cigarettes did not change; in 2009, 21.2% of MS students and 24.0% of HS students were susceptible to smoking [8]. Given that susceptible adolescents have double the risk of taking up smoking as compared with nonsusceptible adolescents, susceptible youth may be a good target for primary prevention [6,9].

It is well documented that pro-tobacco influences such as marketing and advertising are important factors that lead to youth smoking, as adolescents are exposed to various types of media that depict smoking in a positive light (3,10, 11) [3,10,11]. According to the most recent available report from the Federal Trade Commission, it is estimated that cigarette companies spent \$9.9 billion on advertising and promotional expenses in the United States in 2008 [12]. The importance of addressing tobacco industry influences is reflected in a Healthy People 2020 objective, which seeks to “reduce the proportion of adolescents and young adults in grades 6 through 12 who are exposed to tobacco advertising and promotion” [13,14].

Cigarette advertisements and promotions are important influences on beliefs about smoking; evidence suggests that exposure to pro-tobacco advertising is associated with a positive attitude toward smoking. Studies have shown that brand name cigarette use is more concentrated among adolescents [15]; for example, the three most heavily advertised brands (i.e., Marlboro, Newport, and Camel) also happened to be the preferred brands of cigarettes smoked by HS and MS smokers in 2004 and 2006 [16]. As such, smoking adolescents are more adept at identifying tobacco advertising than their nonsmoking peers [17,18], but both nonsmoking and smoking adolescents report that the imagery in cigarette advertisements makes cigarette smoking appear appealing [19]. The vulnerability of adolescents to experimenting and engaging in risk behaviors makes it especially critical to continually monitor and assess exposure to pro-tobacco influences, which not only increase adolescents’ knowledge of cigarettes but also increase their susceptibility to tobacco use [20–22] and the likelihood of experimentation and initiation [21,23,24]. Moreover, in recent years, pro-tobacco influences have increased on the Internet, which is a prime medium to which youth are exposed, so tracking in this medium is also needed.

Although most studies to date focus on the impact of pro-tobacco influences on youth who smoke, there are few studies [21,22] at the national level that assess the relationship with youth who never smoked but are open to trying smoking (i.e., susceptible youth). Also, because the use of the Internet has increased among youth, it is important to investigate the proportion of youth exposed to pro-tobacco influences through this marketing channel over time. Therefore, the purpose of our study was to assess youth exposure to tobacco advertisements through stores, magazines, and the Internet and to examine time trends in exposure to these advertisements for susceptible and nonsusceptible youth among a representative sample of U.S. MS and HS youth. We also examined the associations between MS and HS students’ exposure to pro-tobacco advertisements (stores, magazines, Internet, any of the three, and total number of exposures to tobacco advertising) with susceptibility to smoking using the NYTS. Susceptibility to smoking indicates a willingness to experiment with cigarette use and is an important indicator of the effectiveness of tobacco control policies.

Methods

The NYTS uses a three-stage cluster to generate a nationally representative school-based sample of students in grades 6–12 from all 50 states and the District of Columbia. The NYTS has been conducted approximately every 2 years since 2000 and includes measures on key outcome indicators for tobacco control [26], such as susceptibility to trying cigarettes, current tobacco use, smoking cessation, tobacco-related knowledge and attitudes, access to tobacco, exposure to media and advertising, and exposure to secondhand smoke. Our study used all years of NYTS data: 2000 (35,824 students; overall response rate: 83.7%), 2002 (26,108 students; overall response rate: 74.4%), 2004 (27,933 students; overall response rate: 81.8%), 2006 (27,038 students; overall response rate of 80.9%), 2009 (24,666 students; overall response rate: 84.6%), and 2011 (18,866 students; overall response rate: 73.0%). Details on NYTS’s methodology can be found at http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm.

Definition of susceptibility to smoking cigarettes

Respondents were asked about their use of cigarettes. Those who had never tried smoking cigarettes, even one or two puffs, were defined as “never smokers.” Never smokers who were susceptible to smoking were defined as those who responded in any way other than “no” to the question “Do you think that you will try a cigarette soon?” and responded in any way other than “definitely not” to either question: “Do you think you will smoke a cigarette anytime during the next year?” or “If one of your best friends offered you a cigarette, would you smoke it?”

Definition of pro-tobacco influences

Questions on exposure to tobacco advertisements were also included in the NYTS. Self-reported exposure to advertisements through stores, magazines or newspapers, and the Internet were assessed separately. We considered that students were exposed to pro-tobacco advertisements if they responded to the survey questions listed later in the text with “all of the time,” “most of the time,” or “some of the time”:

Exposure to store advertisements

“When you go to a convenience store, supermarket, or gas station, how often do you see ads for cigarettes and other tobacco products or items that have tobacco company names or pictures on them?”

Exposure to magazine or newspaper advertisements

“When you read newspapers or magazines, how often do you see ads or promotions for cigarettes and other tobacco products?”

Exposure via the Internet

“When you are searching the Internet on a computer, how often do you see ads for tobacco products?” and “When you are using the Internet, how often do you see ads for tobacco products?”

Exposure to any three advertisements

Students who reported being exposed to advertisements in at least one place (stores, magazines, Internet) were considered to have had exposure to any three of the pro-tobacco advertisements.

Data analysis

We used the most recent NYTS data (2011) to describe the demographic characteristics of students in MS and HS who reported exposure to pro-tobacco advertisements and susceptibility to smoking. Students are categorized into MS and HS on the basis of self-reported grade. For 2011, 266 were excluded because of unknown grade; consequently, the final sample size for the 2011 NYTS was 18,600 ($n = 8,880$ for MS; $n = 9,720$ for HS). Our analysis also included a subset of students who never smoked, for which the sample size was 12,609 ($n = 7,068$ for MS; $n = 5,541$ for HS). Among never smokers, 1,658 MS students and 1,382 high school students reported being susceptible to smoking.

Data were adjusted for nonresponses and weighted to produce national prevalence estimates; 95% confidence intervals (95% CIs) were calculated to account for the complex survey design. Logistic regression was used to analyze temporal changes during 2000–2011 for MS and HS students. For this 12-year trend analysis, results were adjusted for grade, race/ethnicity, and sex

to account for any changes in population composition during this period. Results were assessed for the presence of linear trends; p value $< .05$ was used to determine statistical significance. A linear trend indicates an overall change from the beginning to the end of the study period but does not necessarily indicate a constant rate of change. If a linear trend was detected, data were also assessed for the presence of a quadratic trend; a significant quadratic trend indicates that the rate of change accelerates or decelerates once across the period [8].

To examine associations between exposure to pro-tobacco advertisements and susceptibility to smoking by MS and HS students in 2011, we used logistic regression to obtain adjusted odds ratios (ORs) and 95% CIs. ORs were adjusted for grade, sex, race or ethnicity, whether friends smoked, and whether anyone in the home smoked. We included the latter two variables to control for other social and environmental factors. In addition, the total number of advertisement exposure students reported was added for each respondent (range: 0, 1, 2, or 3). The counter was used in multivariate logistic regression analysis, with 0 as the referent.

Results

Characteristics of students exposed to pro-tobacco advertisements

In 2011, with the exception of self-reported exposure to Internet advertisements, self-reported exposure to magazine ad-

Table 1

Prevalence of exposure to pro-tobacco advertisements, by demographic characteristics of middle school and high school students, National Youth Tobacco Survey, 2011

Characteristics	Pro-tobacco influences			
	Store ads % (95% CI)	Magazine ads % (95% CI)	Internet ads % (95% CI)	Exposure to any three ads ^a % (95% CI)
Middle school				
Total	81.5 (80.0–82.9)	48.2 (46.0–50.4)	40.8 (38.9–42.7)	90.7 (89.7–91.6)
Sex				
Male	79.0 (76.2–81.5)	48.4 (46.1–50.7)	38.3 (35.7–41.0)	90.3 (88.3–91.9)
Female	84.0 (81.4–86.3)	48.0 (44.8–55.2)	43.3 (41.0–45.7)	91.1 (89.5–92.5)
Grade				
6 th	76.6 (74.5–78.5)	45.2 (41.1–49.5)	35.9 (33.4–38.4)	88.3 (86.7–89.7)
7 th	81.8 (79.3–84.0)	48.3 (44.6–52.0)	43.5 (40.2–46.9)	90.7 (88.7–92.4)
8 th	86.0 (83.6–88.1)	50.6 (48.1–53.2)	43.1 (40.3–45.9)	92.9 (91.8–93.9)
Race/ethnicity				
White, non-Hispanic	83.2 (80.8–85.3)	47.8 (44.1–51.4)	41.1 (38.3–44.0)	91.2 (89.6–92.5)
Black, non-Hispanic	77.5 (74.3–80.4)	47.9 (43.6–52.3)	42.5 (38.6–46.5)	89.5 (86.5–91.9)
Hispanic	80.6 (78.4–82.6)	49.9 (47.5–52.2)	39.7 (37.0–42.5)	90.6 (88.9–92.1)
Asian, non-Hispanic	74.4 (65.8–81.4)	40.3 (33.0–48.1)	42.0 (36.0–48.2)	85.5 (79.4–90.0)
High school				
Total	86.9 (85.3–88.3)	54.0 (52.3–55.8)	40.2 (38.7–41.8)	92.9 (92.0–93.7)
Sex				
Male	85.7 (83.6–87.6)	52.8 (50.8–54.8)	36.7 (35.0–38.5)	92.4 (91.2–93.5)
Female	88.2 (86.5–89.8)	55.3 (53.0–57.5)	43.8 (41.5–46.1)	93.4 (92.3–94.4)
Grade				
9 th	87.7 (85.3–89.7)	53.6 (50.5–56.7)	42.3 (39.2–45.4)	93.8 (92.0–95.2)
10 th	86.6 (84.2–88.8)	52.7 (49.9–55.5)	39.5 (36.6–42.4)	92.7 (91.1–93.9)
11 th	86.5 (84.1–88.6)	54.3 (50.9–57.7)	40.8 (38.0–43.6)	92.6 (90.8–94.1)
12 th	86.6 (84.4–88.5)	55.6 (52.4–58.8)	38.0 (35.4–40.7)	92.4 (90.7–93.8)
Race/ethnicity				
White, non-Hispanic	88.7 (86.8–90.4)	54.5 (52.2–56.8)	40.8 (38.7–42.9)	93.4 (92.1–94.4)
Black, non-Hispanic	84.1 (81.3–86.5)	53.9 (50.6–57.2)	37.7 (34.8–40.8)	91.7 (90.0–93.2)
Hispanic	85.6 (84.0–87.0)	52.7 (49.9–55.5)	40.0 (37.9–42.1)	93.2 (91.9–94.3)
Asian, non-Hispanic	79.7 (71.5–86.0)	52.4 (46.1–58.7)	38.5 (32.6–44.9)	92.2 (86.8–95.6)

Ads = advertisements; CI = confidence interval.

^a Stores, magazines, or the Internet.

vertisements and store advertisements was lower for MS students than for HS students (Table 1). The proportion of MS students who reported exposure to tobacco advertisements through the Internet was 40.8%; magazines, 48.2%; and stores, 81.5%; for HS students, the proportion exposed through the Internet was 40.2%; magazines, 54.0%; and stores, 86.9% (Table 1). There were more differences by demographic characteristics noted for MS students than for HS students. For example, a higher proportion of eighth graders (86.0%; 95% CI: 83.6–88.1) than sixth graders (76.6%; 95% CI: 74.5–78.5) reported seeing tobacco advertisements in stores. As grade increased, the proportion of MS students exposed to any tobacco advertising also increased (Table 1). Across school type, store advertising peaked in the 9th grade, magazines in the 12th, and the Internet in the 7th grade.

By race/ethnicity, MS (77.5%; 95% CI: 74.3–80.4) and HS (84.1%; 95% CI: 81.3–86.5) black students were less likely to report seeing store advertisements compared with MS (83.2%; 95% CI: 80.8–85.3) and HS white students (88.7%; 95% CI: 86.8–90.4). MS and HS female students were more likely to report seeing tobacco advertisements on the Internet compared with MS and HS male students (Table 1).

Characteristics of susceptible middle and high school students

In 2011, 22.5% of MS and 24.2% of HS students who never smoked reported being open to trying smoking cigarettes in the

Table 2
Demographic characteristics of middle and high school students who never smoked and are susceptible^a to trying smoking, National Youth Tobacco Survey, 2011

Characteristics	Never smokers who are susceptible ^b (n = 3,043) %(95% CI)
Middle school	n = 1,658
Total	22.5 (19.9–22.6)
Sex	
Male	23.3 (20.7–26.1)
Female	21.7 (19.6–24.0)
Grade	
6th	18.8 (15.6–22.5)
7th	21.3 (19.1–23.6)
8th	28.0 (25.1–31.1)
Race/ethnicity	
White, non-Hispanic	21.3 (18.7–24.1)
Black, non-Hispanic	21.0 (18.3–24.0)
Hispanic	27.8 (24.4–31.1)
Asian, non-Hispanic	15.3 (9.8–23.1)
High school	n = 1,385
Total	24.2 (22.3–26.2)
Sex	
Male	23.8 (21.5–26.3)
Female	24.5 (22.2–27.2)
Grade	
9th	26.5 (23.6–29.7)
10th	25.5 (22.1–29.0)
11th	22.2 (19.8–24.9)
12th	21.0 (17.3–25.3)
Race/ethnicity	
White, non-Hispanic	23.3 (20.9–25.9)
Black, non-Hispanic	17.5 (14.6–21.0)
Hispanic	34.2 (30.9–37.6)
Asian, non-Hispanic	21.1 (14.5–29.6)

^a Students reporting that they never smoked not even one or two puffs, n = 12,609.

^b Susceptible students reported never smoking but are open to trying.

^c Weighted percentages.

next year (Table 2); since 2000, no changes in susceptibility to try smoking have occurred (data not shown) [8]. Among MS students, eighth graders (28.0%; 95% CI: 25.1–31.1) were more susceptible to smoking when compared with sixth (18.8%; 95% CI: 15.6–22.5) and seventh (21.3%; 95% CI: 19.1–23.6) graders. Hispanic MS students (27.8%; 95% CI: 24.4–31.1) were more susceptible to smoking than non-Hispanic whites (21.3%; 95% CI: 18.7–24.1), non-Hispanic blacks (21.0%; 95% CI: 18.3–24.0), and Asians (15.3%; 95% CI: 9.8–23.1). Hispanic HS students (34.2%; 95% CI: 30.9–37.6) were more susceptible to smoking than non-Hispanic whites (23.3%; 95% CI: 20.9–25.9), non-Hispanic blacks (17.5%; 95% CI: 14.6–21.0), and Asians (21.1%; 95% CI: 14.5–29.6) (Table 2).

Trends in exposure to tobacco advertisements for susceptible and nonsusceptible youth

From 2000 to 2011, significant linear trends were observed for all types of exposure to tobacco advertising among susceptible and nonsusceptible MS students, with the exception of susceptible MS students who reported seeing Internet tobacco advertisements (Figure 1). Among susceptible and nonsusceptible MS students, significant quadratic trends were observed for magazine advertisements and any three advertisements. Among susceptible MS students, significant quadratic trends were also observed for store advertisements and Internet tobacco advertisements for nonsusceptible MS students (Figure 1). Self-reported exposure to magazine advertising declined from 71.8% in 2000 to 46.1% in 2009 among susceptible MS students; however, exposure increased to 55.4% in 2011. From 2000 to 2011, exposure to any three advertisements among susceptible (95.7% in 2000 and 94.4% in 2011) MS students remained high (Figure 1). From 2000 to 2011, significant linear trends were observed for all types of exposure to tobacco advertising among susceptible and nonsusceptible HS students, with the exception of susceptible HS students who reported seeing any advertisements (Figure 2). Among susceptible and nonsusceptible HS students, significant quadratic trends were observed for magazine advertisements. Tobacco advertising seen through the Internet among susceptible high school students increased from 25.9% in 2000 to 44.7% in 2011 (relative change of 72.6%). As was the case for MS students, a large proportion of HS students were exposed to tobacco advertising through any three channels.

Association between exposure to tobacco advertising and susceptibility to smoking

Among MS students, each place of exposure to tobacco advertising was associated with an increased likelihood of being susceptible to smoking cigarettes (Table 3). For example, MS students who reported seeing tobacco advertising in stores had a higher odds of being susceptible to trying cigarettes than those who did not see such advertising (OR: 1.7; 95% CI: 1.2–2.4). A dose–response relationship between the total number of tobacco advertisement exposures and susceptibility to smoking was also observed ($p < .05$). The odds of susceptibility was three times higher for MS students who reported seeing advertisements in all three places than for those who reported seeing no advertisements (OR: 2.9; 95% CI: 1.8–4.7) (Table 3). No significant relationships were observed between exposure to pro-tobacco advertisements and susceptibility to smoking among HS students.

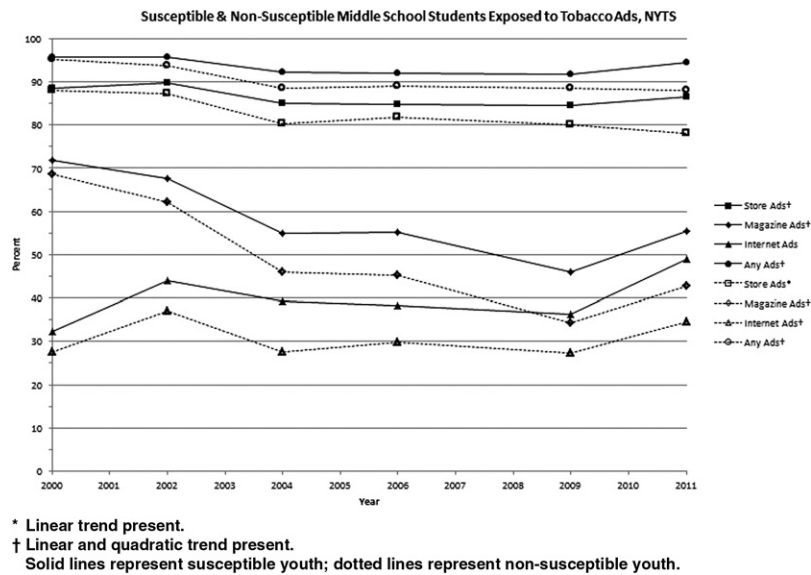


Figure 1. Trends in exposure to pro-tobacco advertisements among susceptible and nonsusceptible middle school students, by place of exposure to advertisement, National Youth Tobacco Survey, 2000–2011.

Discussion

Adolescents continue to be exposed to pro-tobacco advertisements in stores, magazines, and the Internet. Our study highlights that environmental influences that promote the use of tobacco products remain pervasive, despite attempts to reduce youth exposure. Adolescents who are susceptible to smoking report higher levels of exposure to pro-tobacco advertisements than do nonsusceptible adolescents. Studying adolescent never smokers in terms of susceptibility is critical because our efforts need to reach youth as early in the tobacco initiation process as possible; this represents a strong opportunity for primary prevention before nicotine dependence can ensue.

Tobacco control efforts seek to promote health early in life by preventing youth from smoking and by bringing about environ-

mental and social changes to support tobacco-free living. The 1998 Tobacco Master Settlement Agreement [27] prohibited marketing to youth and restricted advertisements in youth-oriented magazines (those for which 15% of readers were 12–17 years of age). However, tobacco advertising still remains in magazines with 20% youth readership [10,11]. We found that, from 2000 to 2009, exposure to tobacco advertising in newspapers or magazines declined for both susceptible and nonsusceptible students in MS and HS; however, such exposure increased from 2009 to 2011. In addition, we found that a large majority of susceptible and nonsusceptible youth were exposed to advertisements in stores and that exposure to pro-tobacco advertisements through the Internet increased over time. A content analysis of adolescents' Internet use showed that 43% of adolescents were exposed to pro-tobacco imagery, with the median expo-

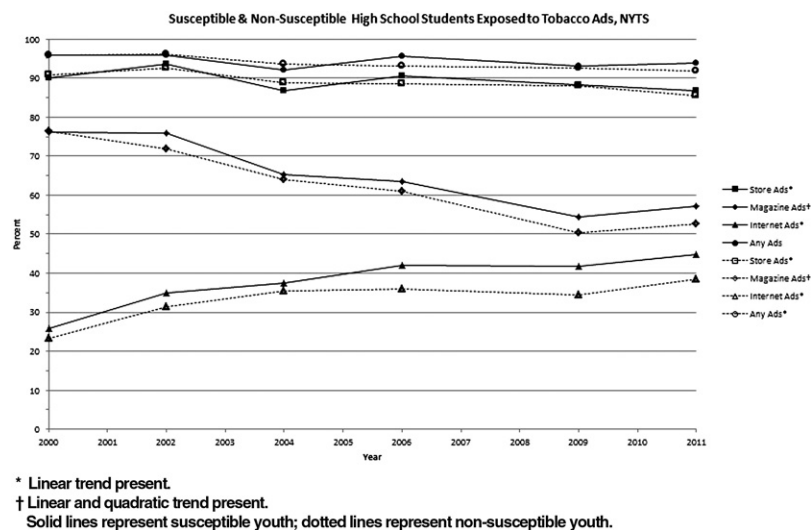


Figure 2. Trends in exposure to pro-tobacco advertisements among susceptible and nonsusceptible high school students, by place of exposure, National Youth Tobacco Survey, 2000–2011.

sure being 3 pages per month [25]. Notably, the Federal Trade Commission report documents increases in Internet advertising and promotional expenditures for smokeless tobacco in the United States between 2006 and 2008 [28]. Regardless of whether the store, magazine, and Internet advertisements were targeted directly toward youth, the presence and documented awareness of these pro-tobacco advertisements is countering efforts to denormalize smoking in youth. To change the social acceptability of tobacco use and smoking, greater efforts to reduce pro-tobacco marketing and advertisements that promote these highly addictive, toxic, and carcinogenic products are needed.

We found no evidence that the proportion of susceptible MS or HS students decreased from 2009 to 2011: MS students 21.2% in 2009, 22.5% in 2011; HS students 24.0% in 2009, 24.2% in 2011. This finding is similar to a previous report on trends from 2000 to 2009 for susceptibility among youth [8]. The lack of change in susceptibility to trying cigarettes may partially explain why the decline in smoking among youth has slowed. Susceptibility to try smoking is an important indicator to track when assessing the effectiveness of tobacco control policies and programs, especially because MS and HS students make up the population most vulnerable to taking up smoking [26]. Our findings make clear that more advertising and promotion restrictions are needed, especially at point of sales because most youth report being exposed to tobacco marketing in the store environment. Thus, a comprehensive approach should include advertising and promotion restrictions in addition to tobacco-free policies, mass media campaigns, and increases in retail price through excise taxes to prevent and reduce youth tobacco use [29].

Our study also examined pro-tobacco influences on susceptibility among both MS and HS youth at the national level, providing a developmental perspective. Our findings are similar to other study findings in that MS students exposed to pro-tobacco

advertisements have a higher odds of being susceptible to smoking when compared to students not exposed. Early adolescence may be a critical period to study in order to learn more about young people's receptivity to messages, regardless of whether they are pro- or antitobacco. In contrast, no relation was observed among HS students, which indicates that other factors may be more important determinants of smoking susceptibility at that stage.

There are several limitations that should be mentioned. First, temporal and causal relationships between pro-tobacco advertisements and susceptibility to smoking among youth cannot be made because of the cross-sectional design of the NYTS. Second, data are based on self-reports, and recall bias may have occurred. Third, we cannot be sure where the pro-tobacco advertisements on the Internet originate because the survey questions do not ask about tobacco companies. Therefore, Internet exposure may be due to influences that promote the tobacco products in other ways (e.g., YouTube). Similarly, it should be noted that youth who responded seeing store advertisements may be responding based on exposure to "powerwall" display of tobacco products in the retail environment, which in itself serves as an advertisement [30]. Fourth, the study only assessed three marketing channels and did not include exposure through sponsorship, direct mail, or brand appearance in movies. Finally, the NYTS is conducted among students in school, and it cannot assess susceptibility or exposure to pro-tobacco influences among youth who have dropped out of school or youth who are not enrolled in school. This may lead to possible underreports for these measures, especially for some subpopulations where studies have shown targeted marketing of specific tobacco products toward youth in low-income African American HS neighborhoods [31].

Despite these limitations, our study indicates that, nationally, a large proportion of MS and HS youth continue to be exposed to pro-tobacco advertisements. Among MS and HS students who never smoked, the overall proportion who are susceptible to smoking has not changed since 2000. Most importantly, early adolescence (MS) appears to be a critical period with respect to associations between pro-tobacco influences and susceptibility to smoking. Cigarette smoking is well established as a leading cause of morbidity and mortality, especially for multiple cancers; the biologic mechanisms for how the carcinogens in cigarette smoke cause cancers and other diseases are now well documented. Preventing cigarette smoking early in life is critical to curbing the smoking epidemic and its health sequelae because the majority of adult smokers begin smoking as adolescents [4]. To accomplish this, further efforts are needed to reduce exposure to tobacco advertisements in conjunction with the comprehensive tobacco control programs that include evidence based strategies like the price of tobacco products and creating 100% tobacco-free environments [32]. In addition, the exposure to tobacco advertisements reinforces the importance of efforts to provide counteradvertising and education, such as graphic warnings on cigarette packs and mass media counteradvertising campaigns. Given the findings from our study, these evidence based strategies to counter exposure need to be enhanced if further progress is to be made in reducing the economic and health burden of cigarette smoking.

Table 3

Susceptibility prevalence^a and adjusted odds ratios^b for the relationship between exposure to pro-tobacco advertisements and susceptibility to smoking among middle and high school students, National Youth Tobacco Survey, 2011

Exposure to pro-tobacco advertisements	% ^a	Middle school OR (95% CI)	% ^a	High school OR (95% CI)
Stores				
No	15.2	1.0 (referent)	22.3	1.0 (referent)
Yes	24.4	1.7 (1.2–2.4)	24.4	1.1 (.8–1.4)
Magazines				
No	19.4	1.0 (referent)	23.1	1.0 (referent)
Yes	28.5	1.6 (1.3–1.9)	26.5	1.1 (.9–1.4)
Internet				
No	18.4	1.0 (referent)	22.2	1.0 (referent)
Yes	29.0	1.6 (1.3–2.0)	27.1	1.2 (1.0–1.6)
Any three ads				
No	12.3	1.0 (referent)	19.5	1.0 (referent)
Yes	24.3	2.2 (1.4–3.3)	24.6	1.2 (.8–2.0)
Total number of ad exposure				
0	12.3	1.0 (referent)	19.5	1.0 (referent)
1	19.0	1.7 (1.1–2.4)	21.9	1.1 (.7–1.7)
2	26.4	2.4 (1.6–3.7)	25.5	1.3 (.8–2.2)
3	31.1	2.9 (1.8–4.7)	27.4	1.4 (.9–2.2)

OR = odds ratio.

^a Weighted percentage susceptible.

^b Odds ratios adjusted for grade, sex, race/ethnicity, exposure to peer smoking, and exposure to smoking at home.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

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